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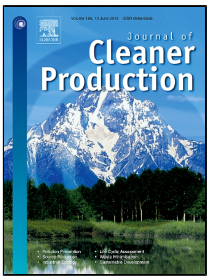

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Optimization of activated carbon production from sunflower seed extracted meal: Taguchi design of experiment approach and analysis of variance

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Abstract

Taguchi method has been applied to design optimal activation conditions in the production of activated carbon with high specific surface area using sunflower seed extracted meal through chemical activation using either zinc chloride or phosphoric acid. The activation temperature and the impregnation ratio were selected as the factors of the activation process to be optimized. The activated carbons were prepared according to the L9 orthogonal array. Brunauer-Emmett-Teller surface area of the activated carbons was calculated by using nitrogen adsorption data obtained at -196 °C. The optimum level of the activation temperature for preparing the activated carbon with a high surface area was 600 °C for both chemical agents. The optimal levels of the impregnation ratio for a high specific surface area were determined as 3:1 and 2:1 for zinc chloride and phosphoric acid, respectively. The results of this study showed that the activation temperature is the most significant factor to get activated carbons with higher specific surface area. Taguchi method also allows a more detailed and accurate assessment to prepare the activated carbon in a cleaner way.

Keywords: biomass; sunflower; activated carbon; chemical activation; optimization; Taguchi method

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